

# SOIL HEALTH INITIATIVES IN NEW YORK: BUILDING MOMENTUM



*Fishkill Farms, East Fishkill, New York*

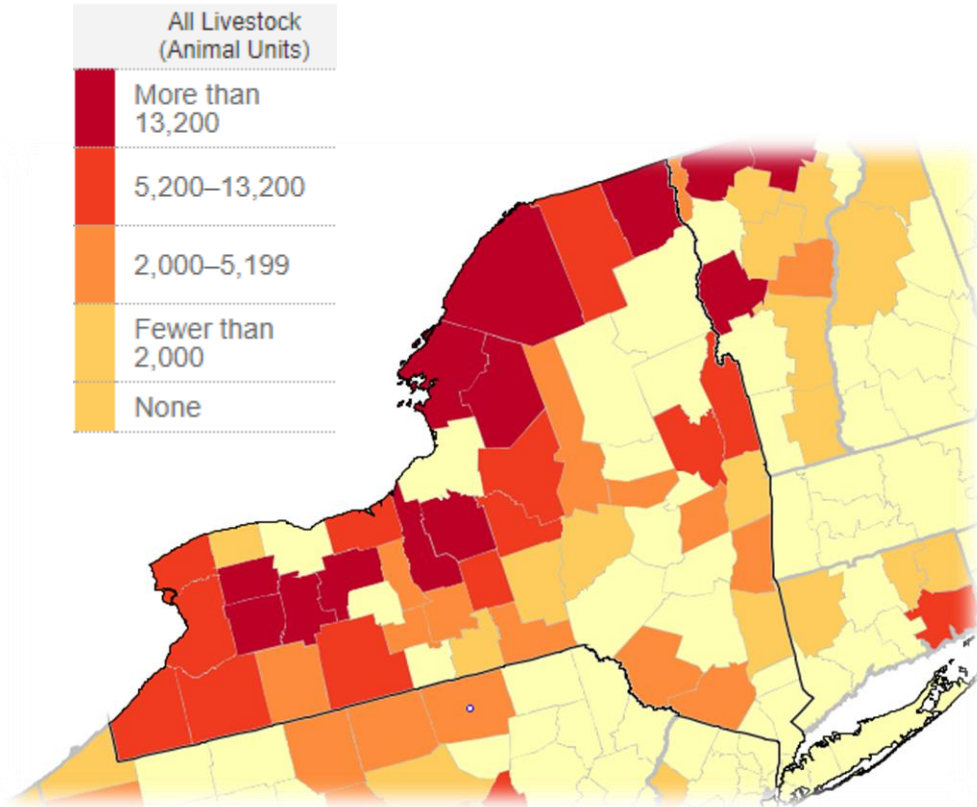
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# AGRICULTURE IN NEW YORK STATE: INDUSTRIAL AND CONCENTRATED



- **23%** of land use is agricultural
  - **4.2 million** acres of crops and **2.7 million** acres of grazing land
- **35,500** farms
  - **3%** account for **60%** production (by market value of sales)
- **19,900** operations with animals
  - **3%** produce **85%** of beef cattle, dairy cows, swine, poultry



# IMPACTS OF INDUSTRIAL AGRICULTURE IN NY



- Harmful algal blooms caused by manure runoff from NY CAFOs
  - Example: 2014 spill in Lake Owasco
- Nitrogen fertilizer contamination
  - **30+** NY drinking water systems/utilities with **>5 ppm** (above health guideline)
- **4%** of all GHG emissions
  - **23%** of all methane; **75%** of all nitrous oxide
- Wildlife habitat loss from cropland conversion
  - 163,000 new cropland acres; 1,381 acres wetlands converted (2008 - 2012)

# CLIMATE CHANGE THREATENS NY AGRICULTURE



*Crop damage in New Paltz, NY after Hurricane Irene (2011)*

- Droughts and floods
- Heat waves
  - \$24.9M annual loss for NY dairy with projected temp. increase
- Hurricanes and extreme storms
  - \$4.5M+ costs for NY farms after Hurricane Irene
- Pests, weeds, disease
  - Stewart's wilt, late blight
- Water supply
- Nutritional value
- Yield reductions

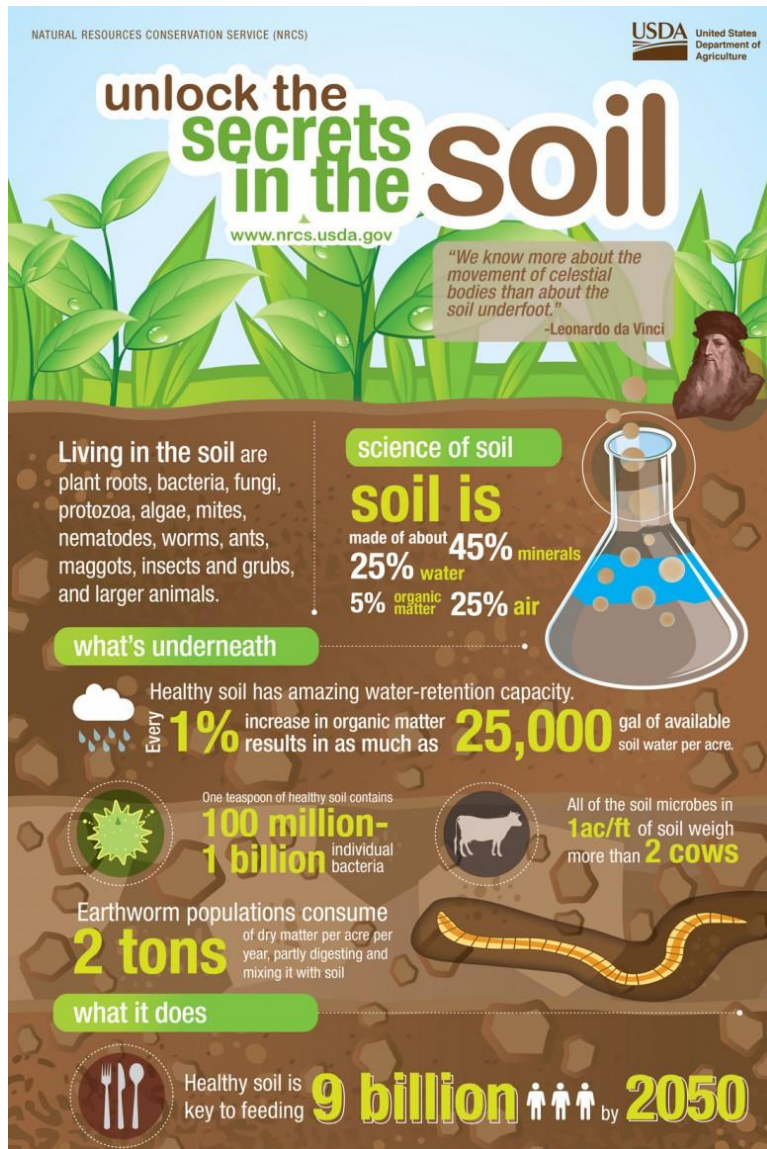


# CURRENT AGRICULTURE SYSTEM IS NOT THE ONLY OPTION






- Current system is profoundly shaped by policy (especially Farm Bill; environmental law exemptions)
- Industrial, chemical-dependent monoculture systems are not necessary to “feed the world”
  - Organic and agro-ecological practices are highly productive
- The “true cost” of food is **at least double** the market price when include environmental and health costs

# GOALS OF A HEALTHY SOIL LAW





- **Reduce GHG emissions** (CH<sub>4</sub>, N<sub>2</sub>O, CO<sub>2</sub>)
- **Increase soil carbon**
- Support **key soil health principles** (e.g. of NRCS or Rodale Institute):
  - Maximize soil surface cover
  - Minimize disturbance of soil
  - Maximize above- and below-ground diversity
  - Maintain continuous living roots in soil
  - Reduce and limit chemical inputs
  - Incorporate animals on cropland

# ALTERNATIVE PRACTICES (1): CROPLAND MANAGEMENT




PRACTICE	GHG Reduction	Public Benefits	Private Benefits	Barriers
<b>Crop rotations</b> 	<b>0.22 – 0.26</b> Mg CO <sub>2</sub> e / acre per year	<ul style="list-style-type: none"> <li>• Reduce erosion</li> <li>• Improve water quality, soil moisture</li> <li>• Soil carbon seq.</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce fertilizer, pesticide, irrigation costs</li> <li>• Economic resilience</li> </ul>	<ul style="list-style-type: none"> <li>• Equipment needs</li> <li>• Labor costs</li> <li>• Market and infrastructure for new crops</li> </ul>
<b>Cover Crops</b> 	<b>0.26 – 0.37</b> Mg CO <sub>2</sub> e / acre per year	<ul style="list-style-type: none"> <li>• Reduce erosion</li> <li>• Improve water quality</li> <li>• Pest suppression</li> <li>• Soil carbon seq.</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce fertilizer, pesticide costs</li> <li>• Reduce on-farm energy use</li> <li>• Improve yield</li> </ul>	<ul style="list-style-type: none"> <li>• Agronomic concerns; interference with cash crop</li> <li>• Equipment needs</li> </ul>
<b>No-till</b> 	<b>0.31 – 0.35</b> Mg CO <sub>2</sub> e / acre per year	<ul style="list-style-type: none"> <li>• Reduce erosion</li> <li>• Improve water and air quality</li> <li>• Prevent soil carbon loss</li> </ul>	<ul style="list-style-type: none"> <li>• Soil health</li> <li>• Reduce fertilizer, irrigation costs</li> <li>• Reduce on-farm energy use</li> </ul>	<ul style="list-style-type: none"> <li>• Agronomic concerns; yield and profitability</li> <li>• Greater herbicide use</li> </ul>

# ALTERNATIVE PRACTICES (2): NUTRIENT MANAGEMENT




PRACTICE	GHG Mitigation	Public Benefits	Private Benefits	Barriers
<p><b>Improve N fertilizer management</b></p> 	<p><b>0.06 – 0.15</b> Mg CO<sub>2</sub>e / acre per year</p>	<ul style="list-style-type: none"> <li>• Reduce N<sub>2</sub>O emissions</li> <li>• Minimize water pollution</li> <li>• Improve air quality (reduce odors, PM)</li> </ul>	<ul style="list-style-type: none"> <li>• Improve soil quality</li> <li>• Improve nitrogen use efficiency</li> <li>• Reduce fertilizer input and costs</li> </ul>	<ul style="list-style-type: none"> <li>• Higher costs of technology and equipment needs</li> <li>• Agronomic concerns and uncertainty; yield, efficacy</li> </ul>
<p><b>Organic soil amendments</b></p> 	<p><b>1.00 – 1.75</b> Mg CO<sub>2</sub>e / acre per year</p>	<ul style="list-style-type: none"> <li>• Reduce CH<sub>4</sub> and N<sub>2</sub>O emissions</li> <li>• Minimize water pollution</li> <li>• Improve air quality (reduce odors, PM)</li> </ul>	<ul style="list-style-type: none"> <li>• Improve soil quality</li> <li>• Reduce irrigation and fertilizer costs</li> <li>• Slow release of nutrients</li> </ul>	<ul style="list-style-type: none"> <li>• More expensive than synthetic fertilizer</li> <li>• Agronomic concerns; efficacy</li> <li>• Composting labor and costs</li> </ul>



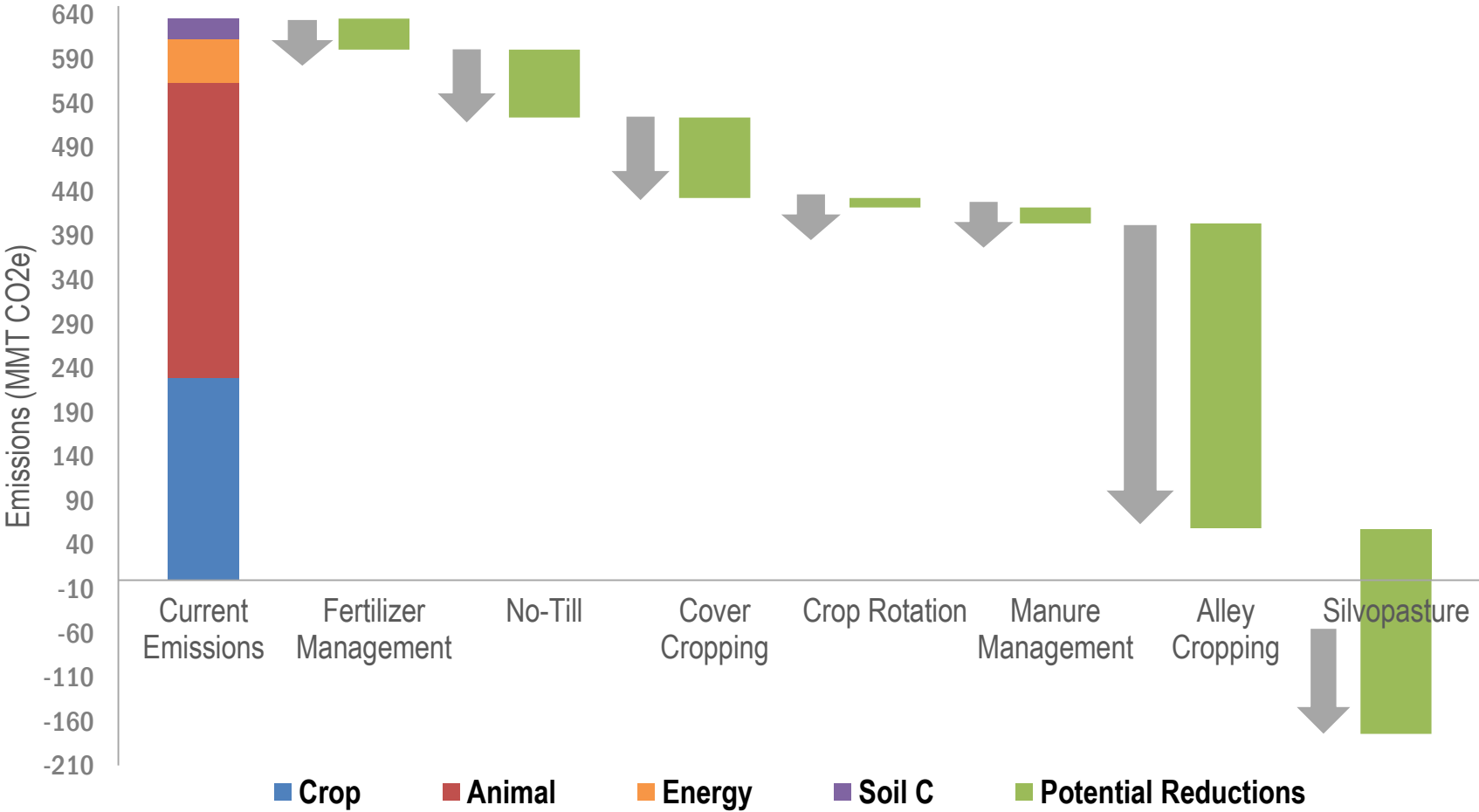
# ALTERNATIVE PRACTICES (3): ANIMAL MANAGEMENT

PRACTICE	GHG Mitigation	Public Benefits	Private Benefits	Barriers
<b>Managed grazing</b> 	<b>0.18 – 0.26</b> Mg CO <sub>2</sub> e / acre per year	<ul style="list-style-type: none"> <li>• Soil health</li> <li>• Prevent overgrazing</li> <li>• Reduce N<sub>2</sub>O</li> <li>• Soil carbon seq.</li> </ul>	<ul style="list-style-type: none"> <li>• Forage quality</li> <li>• Reduce feed use</li> <li>• Weed control</li> <li>• Extend grazing season</li> </ul>	<ul style="list-style-type: none"> <li>• Fencing and labor costs</li> <li>• Production per animal concerns</li> <li>• Land availability</li> </ul>
<b>Cropland to pasture</b> 	<b>0.22 – 0.37</b> Mg CO <sub>2</sub> e / acre per year	<ul style="list-style-type: none"> <li>• Reduce erosion</li> <li>• Minimize water pollution</li> <li>• Prevent soil carbon loss</li> </ul>	<ul style="list-style-type: none"> <li>• New revenue; economic diversity</li> <li>• Forage supply and quality</li> </ul>	<ul style="list-style-type: none"> <li>• Market trends</li> <li>• Fencing, labor, mgmt. costs</li> <li>• Food safety regulations</li> </ul>
<b>Dry manure storage</b> 	<b>N/A</b> ( <i>see “Organic soil amendments”</i> )	<ul style="list-style-type: none"> <li>• Reduce CH<sub>4</sub> and N<sub>2</sub>O emissions</li> <li>• Minimize run-off and water pollution</li> </ul>	<ul style="list-style-type: none"> <li>• Less volume than liquid to store</li> <li>• Reduced odors</li> <li>• High nutrient retention</li> </ul>	<ul style="list-style-type: none"> <li>• Labor needs in collection and handling</li> <li>• Equipment needs</li> </ul>

# ALTERNATIVE PRACTICES (4): AGROFORESTRY AND HERBACEOUS COVER

PRACTICE	GHG Mitigation	Public Benefits	Private Benefits	Barriers
<b>Alley cropping</b> 	<b>0.81 – 1.74</b> Mg CO <sub>2</sub> e / acre per year	<ul style="list-style-type: none"> <li>• Increase water retention and nutrients</li> <li>• Biodiversity</li> <li>• High C storage</li> </ul>	<ul style="list-style-type: none"> <li>• Soil health</li> <li>• Erosion control</li> <li>• Provide shade</li> <li>• Reduce fertilizer needs and costs</li> </ul>	<ul style="list-style-type: none"> <li>• Long return on investment; high initial labor/costs</li> <li>• Management and knowledge</li> </ul>
<b>Silvopasture</b> 	<b>0.66 – 1.34</b> Mg CO <sub>2</sub> e / acre per year	<ul style="list-style-type: none"> <li>• Prevent overgrazing</li> <li>• Improve water quality</li> <li>• High C storage</li> </ul>	<ul style="list-style-type: none"> <li>• Optimize forage and timber production</li> <li>• Provide shade</li> <li>• Weed control</li> </ul>	<ul style="list-style-type: none"> <li>• Regulatory limitations on harvest</li> <li>• Management and knowledge</li> </ul>
<b>Buffer strips</b> 	<b>1.13 – 1.26</b> Mg CO <sub>2</sub> e / acre per year	<ul style="list-style-type: none"> <li>• Reduce nutrient loss, run-off</li> <li>• Improve water quality</li> <li>• Biodiversity</li> </ul>	<ul style="list-style-type: none"> <li>• Soil health</li> <li>• Reduce flooding</li> <li>• Help meet pollution control requirements</li> </ul>	<ul style="list-style-type: none"> <li>• “Hassle” of program (ex. CRP) enrollment</li> <li>• Loss of commodity acres</li> </ul>

# CARBON-NEUTRAL FUTURE: BETTER PRACTICES CAN REDUCE EMISSIONS





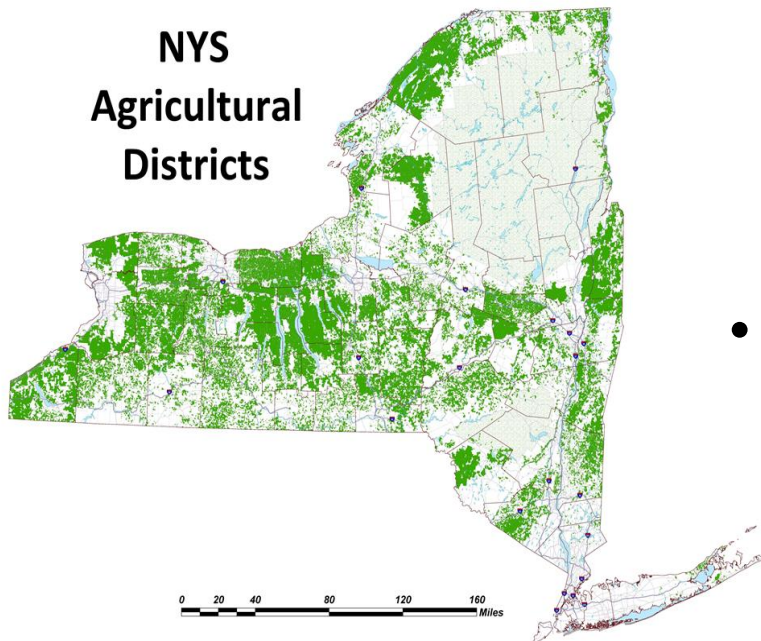
# ALTERNATIVE PRACTICES NEED INCENTIVES TO INCREASE ADOPTION

- Agro-ecological practices are very effective, but not widely employed
  - **>85%** of USDA survey participants would NOT adopt structural conservation practices without outside funding

PRACTICE	US	NEW YORK
Cover crops	<b>3%</b> of all cropland acres	<b>5%</b> of all cropland acres
No-till	<b>25%</b> of all cropland acres	<b>6%</b> of all cropland acres
Certified organic	<b>&lt;1%</b> of all US farms	<b>3%</b> of NY farms

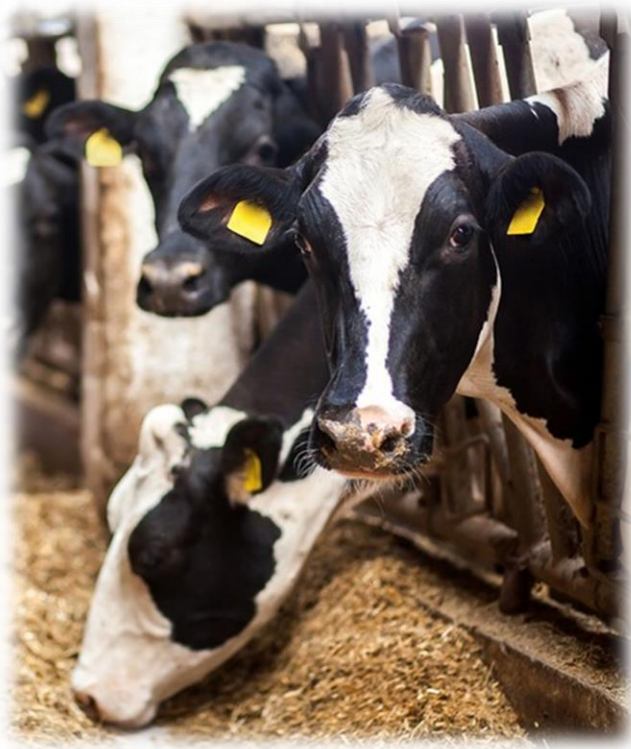
*\*Less than a third of “no-till farms” are truly no-till.*

# CURRENT NEW YORK STATE POLICIES AND FUNDING (1)



- **Climate Resilient Farming Program ([link](#))**
  - \$6 million in funding over past 4 years - most \$ to adaptation; could direct more to soil health
  - \$2.1M for manure storage
  - \$1.9M for water management
  - **\$1M for soil health practices** – mostly for ~8,000 acres of cover crops (~\$100/acre)
- **2019 State of the State ([link](#)):** Governor Cuomo proposes to **double** state funding for the CRF program
  - “Incorporate forest and agricultural carbon into New York’s greenhouse gas inventory and climate strategy”
  - Set soil carbon sequestration goal
  - New forestry grant program

# CURRENT NEW YORK STATE POLICIES AND FUNDING (2)



- **Methane Reduction Plan ([link](#))**
  - Develop on-farm digesters
  - Expand CRF to highlight gas capture
  - Update designs of storage systems; BMP's for animal feeding
- **Climate Adaptation Plan ([link](#))**
  - Climate Smart Communities (no ag yet)
  - Not soil health focused
- **Carbon Farming Act (proposed)**
  - Tax credit for farmers who sequester soil C
- **New York Soil Health Initiative ([link](#))**
  - DAM & DEC contract with Cornell to research practices and policies
  - Stakeholder strategy outlined in "Soil Health Roadmap"



# POLICIES TO ACCELERATE SHIFT TO CLIMATE-FRIENDLY PRACTICES (1): EDUCATION, OUTREACH AND RESEARCH



*NOFA-NY field day at Poughkeepsie Farm Project (2018)*

- Knowledge, information and capacity is major barrier for all practices
- Educational and technical support from:
  - Cornell Cooperative Extension
  - NRCS agents and offices in each county
  - Farmer-to-farmer networks
  - On-farm demonstrations and workshops
- **However**, the majority of NRCS funds and grants still support conventional agriculture

# POLICIES (2): FEDERAL FINANCING



- **Environmental Quality Incentives Program (EQIP)**
  - Funded projects often counter-productive (irrigation, CAFOs)
  - 2018 Farm Bill allows states to provide 90% cost share to 10 “best practices”
- **Conservation Stewardship Program (CSP)**
  - 2018 Farm Bill retained program
  - States can direct toward best practices for organic transition

# POLICIES (3): BUFFERS AND EASEMENTS



- **Conservation Reserve Program (CRP)**
  - Program often provides only temporary benefits
  - Accumulated soil carbon is lost when CRP contracts expire and land is put back in production
  - 2018 Farm Bill allows 30-year contracts on pilot basis
- States can expand **Agricultural Conservation Easement Program (ACEP)**



# POLICIES (4): OTHER FINANCIAL SUPPORT

- **Market assistance**

- Assist infrastructure for additional crops
- Help build market for new crops (e.g. hops; grains for spirits; new or ancient grains through advertising, etc.)

- **Equipment loans**

- Aid in covering costs of new equipment necessary to implement practices
- Ex. No-till seed drills for producers

- **Preferential purchasing/promotion**

- Govt. purchasing could give preference to organic or other climate-friendly food
- Example: **New York Grown and Certified** (70% people said they would buy more; 50% would pay more)



# POLICIES (5): ADDITIONAL MECHANISMS

- **Crop insurance**

- Provide **transition crop insurance** for farmers transitioning from conventional to sustainable practices (e.g. organic, no-till, cover crops)
- Impose **additional conditions** (e.g. BMPs), on crop insurance, such as expanding the Sodsaver Provision

- Add environmental practice conditions (e.g. BMPs, buffers, cover crops, etc.) on **agricultural district designations**

- **Stricter drinking water protections**

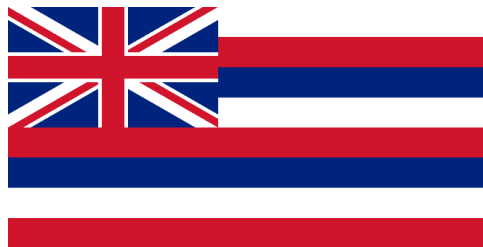
- Ex. impose limits on CAFO manure spreading



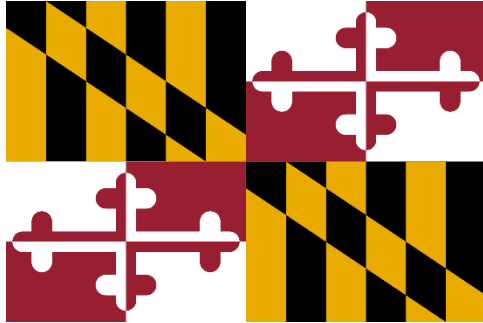
# EXISTING STATE HEALTHY SOIL LAWS (1)



- **California:** [SB859](#) and [AB1613](#) (2016)
  - Creates Healthy Soils Program
  - Defines healthy soils, coordinate agency efforts, R&D, incentives, education
  - AB2377 (2018) – 5% of Climate Smart Ag funding for technical assistance (25% of funds for socially-disadvantaged farmers)
  - \$7.5M for program and demonstrations
- **Hawaii:** [HB 1578](#) (2017)
  - Identifies, measures, encourages soil health practices
  - Promotes C sequestration, compost, and agroforestry
  - \$25,000



# EXISTING STATE HEALTHY SOIL LAWS (2)



- **Maryland:** [HB 1063](#) (2017)
  - Defines and supports healthy soils by directing the Agricultural Department to support practices through incentives, R&D, possible funding



- **Oklahoma:** [HB 1192](#) (2001)
  - Creates advisory committee to identify and support practices through R&D, education
  - Funding and opportunities for carbon trading



- **Utah:** [HCR 8](#) (2015)
  - Calls on all agencies “with authority to manage lands to increase soil carbon sequestration”



# PROPOSED STATE HEALTHY SOIL LAWS (1)



- **Washington:** [SB 5947](#) and [HB 2095](#) (2019)
  - Defines carbon farming as activities that “increase the quantity of organic C in topsoil”
  - Provides grant funding for on-farm efficiency, regenerative ag practices that enhance soil health, agroforestry

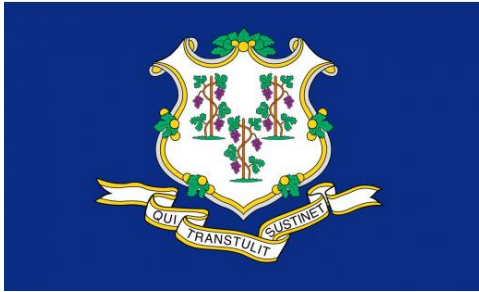


- **Illinois:** [SB 1980](#)/[HB 2737](#) and [HB 2819](#) (2019)
  - Defines soil health, and includes “conservation of soil health” to Soil and Water Conservation Districts Act
  - Requires soil health practices on land leased for agricultural purposes (Dept. of Natural Resources Act)



- **New Mexico:** [HB 204](#) and [SB 218](#) (2019)
  - Defines healthy soils and ID’s practices
  - Includes: soil assessment and education program, healthy soil advisory board, workshops and training
  - Creates “soil health champions”
  - \$5.15M for program (FY2020)

# PROPOSED STATE HEALTHY SOIL LAWS (2)



- **Connecticut:** [HB 6647](#) (2019)
  - Defines regenerative agriculture and establishes program to improve soil health and water quality
  - Healthy soils program provides funding, incentives, education, training



- **Nebraska:** [LB 243](#), [LB 729](#) and [LB 283](#) (2019)
  - Creates Healthy Soils Task Force to develop health soils initiative by 2021
  - Provides incentive of \$20-45/acre for planting cover crops
  - \$250,000 for soil health and climate change research at University of Nebraska



- **Iowa:** [HSB 78](#) and [HF 102](#) (2019)
  - Establishes property tax exemption for land with cover crops
  - Requires Dept. of Ag and Iowa State University to conduct statewide soil health monitoring

# PROPOSED STATE HEALTHY SOIL LAWS (3)



- **New York:** [A 3281](#) (2017)
  - Defines carbon farming using USDA COMET-Planner and COMET-Farm
  - Establishes tax credit to encourage C seq.
- **Vermont:** [S 43](#) (2017)
  - Requires the Sec. of Natural Resources to establish a regenerative soils program
  - Incentivizes C seq. with certification and marketing program, technical and financial assistance
- **Massachusetts:** [SD 1438](#) and [HD 3065](#) (2019)
  - Creates Massachusetts Healthy Soils Program
  - Defines and promotes healthy soils practices
- Legislation drafted in **Kansas, Kentucky, Missouri, Colorado, Pennsylvania**

State	Water Quality / Quantity Goal	Climate Change Mitigation Goal	Other Goals	“Healthy Soil” Definition	Specific Practices Identified	Committee, Task Force and/or Agencies	Research and Education	Technical Assistance	Funding and Financial Assistance
CA	✓	✓	Yields, erosion, air	✓	No-till, cover crops, compost, grazing	✓	✓	✓	\$7.5 M
HI	✓	✓	Resilience, trading	✓	Compost, agroforestry	✓	✓	✓	\$25,000 for study
MD		✓	Yields	✓		Dept. of Ag.	✓	✓	
OK		✓	Trading		Trees, conservation, re-vegetation	✓	✓	Measurement	Creates fund
UT	✓	✓	Productivity, biodiversity		Advance forestry, grazing	✓		“Encourages”	
WA		✓	Profitability, energy use	Carbon farming	Trees, no-till, cover crop, grazing	✓			Creates fund
IL	✓		Climate resilience	✓	Perennials				Soil and Water Cons. Districts
NM			Yields, profitability	✓	No-till, cover crops, compost, mulch, grazing	✓	✓	✓	\$5.15 M
CT	✓		Erosion,	✓	No-till, cover crops, grazing, integration	✓	✓	Training	Creates fund
NE	✓	✓	Profitability, resilience	✓	Cover crops	✓			\$20-40/acre for cover crops
IA					Cover crops		✓		Tax exemption for cover crops
NY	✓	✓	Yields	Carbon farming	Refers to COMET-Planner		✓	Certificate	Tax credit
VT	✓	✓	Climate resilience	Performance based	No synthetic chemicals	✓		Certificate	Marketing program
MA		✓		✓	No-till, cover crops, grazing, integration	✓	✓	✓	Creates fund



# POSSIBLE KEY ELEMENTS OF MODEL LAW

- **Findings:** Benefits of health soils
- **Define:** Healthy soils
- **Goal:** To increase adoption of practices that create healthy soils
- **Actions:**
  - 1) Require agencies to consider and coordinate
  - 2) Identify healthy soil practices and goals
  - 3) Provide funding for R&D and demonstration projects
  - 4) Provide education, training, and technical assistance
  - 5) Provide financial incentives – either payments for practices or tons of carbon sequestered
  - 6) Work group to propose
  - 7) Create preferential purchasing and marketing programs and certification programs
  - 8) Create transition insurance program to help counter risk of adopting healthy soil practices
- **Funding Options:**
  - General funds
  - Fertilizer surcharge, storm water fee, or other impact fee (parallel to environmental benefit charge)
  - Funds from carbon cap and trade program, or carbon fee
  - Redirect federal EQIP, CSP, etc. funds to preference soil health practices

# ADDITIONAL RESOURCES (1)

- **U.S. Department of Agriculture (USDA)**
  - \$15.9M in funding for microbiome research
  - \$71M in funding for “10 Building Blocks for Climate Smart Agriculture”
- **USDA Natural Resources Conservation Service (NRCS)**
  - “Unlock the Secrets in the Soil” ([link](#))
- **Regenerative Agriculture Initiative ([link](#))**
  - Supports this definition: “a holistic land management practice that leverages the power of photosynthesis in plants to close the carbon cycle, and build soil health, crop resilience, and nutrient density.”
  - Annie’s, Cascadian Farms, Ben & Jerry’s, Dr. Bronner’s, Organic India and Nutiva
- **Samuel Roberts Noble Foundation ([link](#)) & the Farm Foundation ([link](#))**
  - Soil Health Institute ([link](#)); \$200M in funding for agricultural research
- **Soil Health Partnership ([link](#))**
  - Quantify benefits of improved agricultural practices; technical assistance for farmers

# ADDITIONAL RESOURCES (2)

- **U.S. Climate Alliance ([link](#))**
  - Helps states achieve climate goals with natural & working lands management
  - Partnership includes: [American Farmland Trust](#), [American Forests](#), C-AGG (see below), [The Nature Conservancy](#), [Trust for Public Land](#), [World Resources Institute](#)
- **Coalition on Agricultural Greenhouse Gases (C-AGG) ([link](#))**
  - Multi-stakeholder organization that develops sustainable policies/programs/tools
- **Northeast Organic Farming Association ([link](#))**
  - State chapters in [NY](#), [MA](#), [CT](#), [NH](#), [NJ](#), [RI](#), [VT](#)
  - Advocate for organic farming, build community and support for producers implementing organic practices (NOFA Interstate Policy Committee)
- **Foundation for Food and Agriculture Research ([link](#))**
  - Established as part of the 2014 Farm bill with initial \$200M funding for R&D
  - Grant opportunities for organizations and universities to advance food and ag science
  - Fosters public-private partnerships

# ADDITIONAL RESOURCES (3)

- **CalCAN (California Climate & Agriculture Network) ([link](#))**
  - State-wide coalition of farmers, ranchers, non-profits, scientists, etc.
  - Advocates for policies that support climate-friendly agricultural practices
- **Organic Farming Research Foundation ([link](#))**
  - Grant opportunities and advocacy for organic research, education and federal policies
  - Recipient of \$66,000 matching grant from FFAR for research projects on soil health
- **U.S. Dept. of Energy's Advanced Research Projects Agency ([link](#))**
  - \$30M in funding for Rhizosphere Observations Optimizing Terrestrial Sequestration program
- **USDA National Institute of Food and Agriculture ([link](#))**
  - \$8M in funding for understanding various microbiomes and their effects on food production systems
- **Legal Pathways to Carbon-Neutral Agriculture ([report link](#))**
  - Peter Lehner & Nate Rosenberg (2017). Environmental Law Reporter.